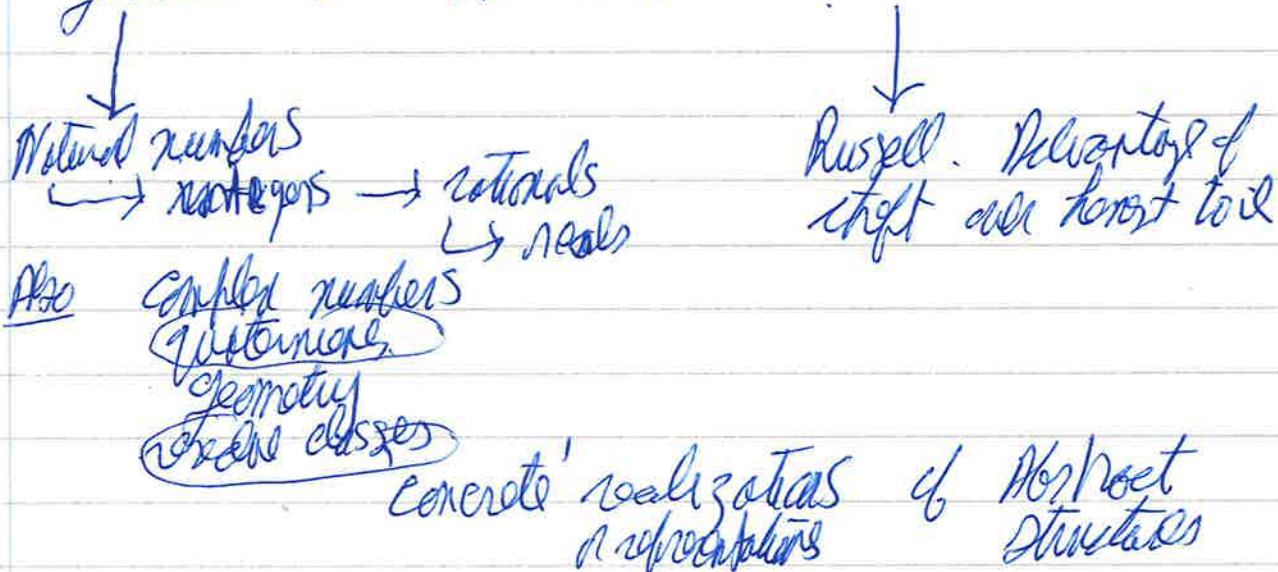


4. what distinguishes Planch. from Arbitrary Spelling 1

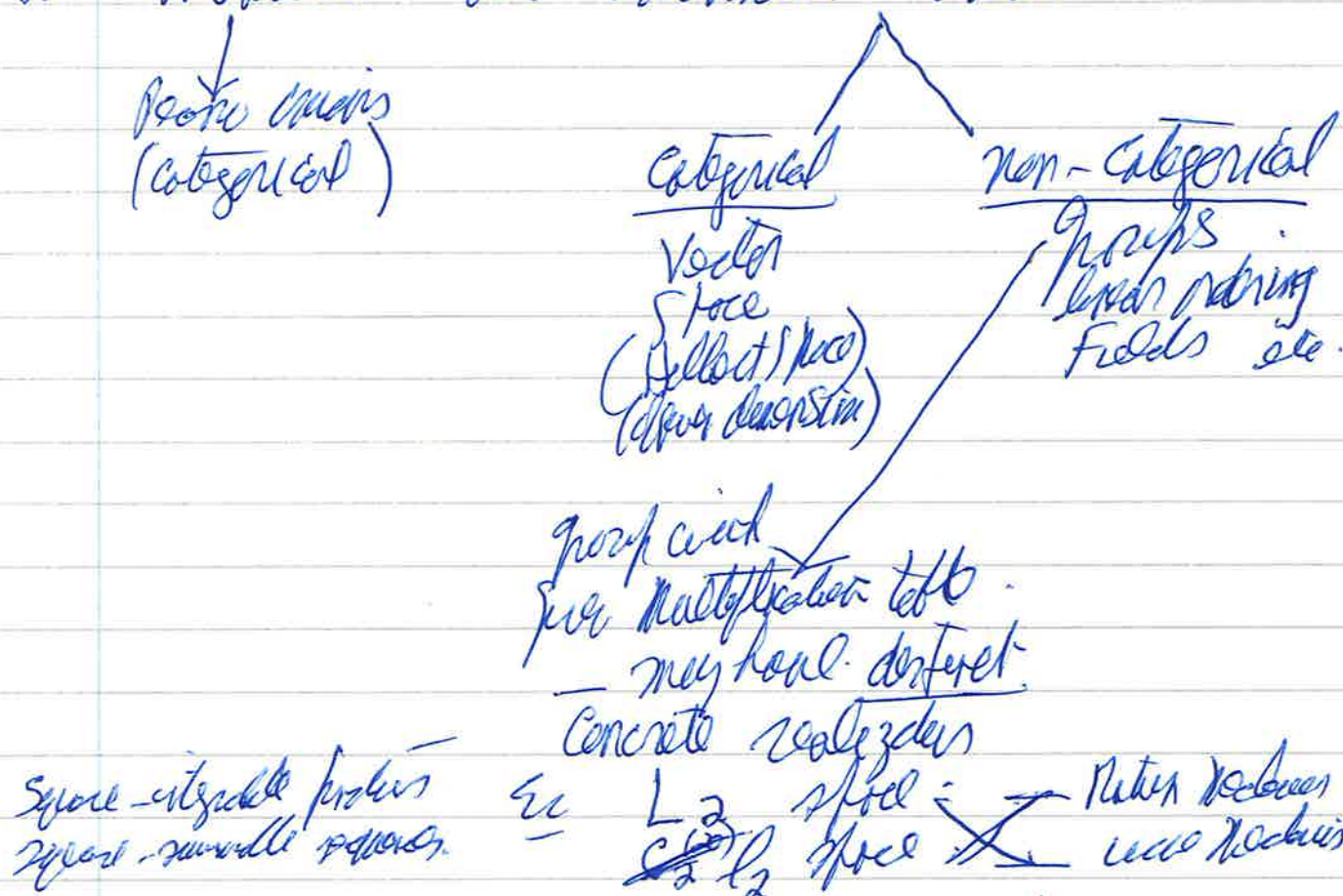
The Role of Mathematics in Physics

The Nature of Mathematics

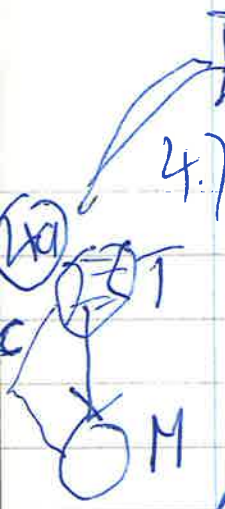
1. Genetiv. v. Axiomatic method.



2. Intentional w. Extensional semantics



3. Mathematical models are concrete realizations or abstract structures



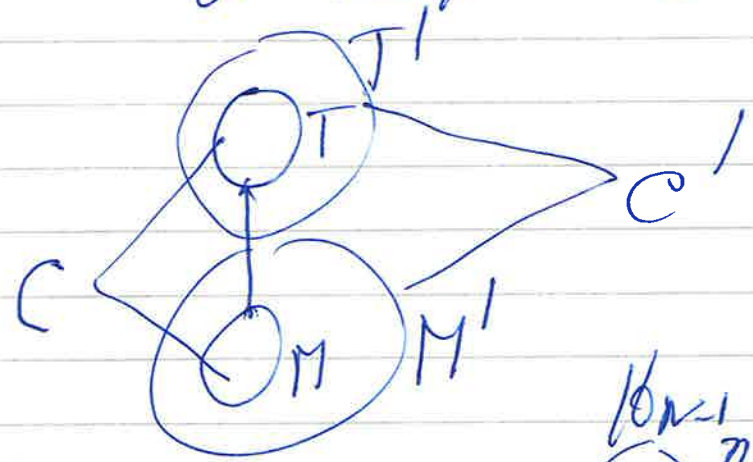
4.7 ^{what distinguishes Mathematical structures from arbitrary constructed structures}
 determined by defn, e.g. physical theory would be mathematical

Ans set of all Concrete realizations in terms of mathematical objects - included infinite for numbers.

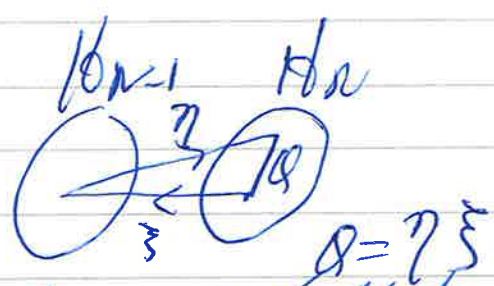
5. Use of non-categorical structures
 ex groups - economy of not repeating same argument in many different contexts.

6. Different ways of formulating a theory in terms of Surfaces structures
 exs

Injection morphism



exs a) 2nd quantization



b) Analytic S-matrix and not on lattice in complex plane.

c) Rigorous exact states of electron in the Dirac theory.

6a) Diagram for 2nd quantization example.

7. Heuristic Role of Surfaces Structures
 ex Q.E.D.
 Higgs theory & positrons
 gauge theories of EM.

8) Why is Mathematics successful?

cf. Philosophy
Galileo

Does not quantify aspects of the world (what can be measured) of Galileo
Archimedes, geometry extended from empirical experience of natural world, does not explain more sophisticated examples.

Hilbert Space, QM
Riemannian Geometry, G.R.

How - Problems amenable to mathematicians first to be treated - classical mechanics v. nuclear physics

9) * Computation gap - Empirical. Mathematicians - often confused justified in terms of successful predictions

10) The Role of the Computer - this problem has not really gone away.

11) Progress in Mathematics: Desiderata from modern abstract approach.
Ex. 3 theorems, 1000 years

12) Students in abstract physics etc must register - Desiderata: separation but balance against slowness or irrelevant reasoning.

13) The Nature of Idealization: -

cf. Philosophy
from abstract
more abstract
Addition of ideal elements - set
of points - cf. Hilbert v.
Cauchy on nature of formalist approach
to Mathematics - cf. earlier structures
discussed above.

14.) Modern Relativity: Since the age of
 age of Decadence — ^{not}
 of significant relativity in ^{not}
 relativity

15.) Interaction between physics &
 Mathematics

Kepler ellipses
 Hilbert Space - QM
 Heisenberg uncertainty - QM

16.) ~~Conclusion~~ The use of mathematical
 physics to predict precise events
 like ground state of Helium
 level shift
 Anomalous shift of orbitals
 (10 significant figures)
 How is this possible??

Well, and then further math I
 think I will keep and
 look forward to common and
 discussion for the address.

Quotations

Galileo : If ears, tongues and noses
were removed, shapes, numbers &
measures would remain — The Assayer

The book of Nature is written in
mathematical characters — The Assayer.

Russell The power (Arithmetic) has the
ontology of theft and honest toil